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ABSTRACT

This report describes the process and results of a collaborative annotation process for inserting internal, conceptual linking in a book about hypertext design and the implications of that process for designing collaborative hypertext environments. The book was the product of a NATO (North Atlantic Treaty Organization)-sponsored Advanced Research Workshop, "Designing Hypertext/Hypermedia for Learning" (Jonassen & Mandl, 1990). Following the workshops, the contributors were asked to revise their papers to reflect the ideas and discussions shared at the workshop. Each paper needed to make heavier use of headings, include a list of keywords, state its assumptions about learning and characteristics of hypertext, and provide some advice or guidelines for designing hypermedia for learning. The revised papers were edited and reorganized into sections reflecting themes of the workshop. Copies of the entire book without any annotations were then sent to the workshop participants with a request that they read and annotate the other papers. They were given the option of using three types of annotations: qualified (predefined relations with other text in the book), unqualified (short comments about text), and references to external documents omitted in the paper. Over 300 annotations were submitted via electronic mail and added to the book. A survey was then sent to the participants who submitted annotations (65%) to ascertain the advantages and difficulties of the process. A discussion of their responses and recommendations based on the annotations and survey responses conclude the report. (6 references) (BBM)

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COLLABORATIVE ANNOTATION OF A HYPERBOOK ON HYPERMEDIA DESIGN

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Introduction

Collaboration in the utilization and construction of hypertext knowledge bases is perhaps the most important characteristic of successful learning-oriented hypermedia applications (Duffy & Jonassen, in press; Jonassen, 1989). Collaboration engages learners in constructive processing of the information rather the mere reception and shallow encoding of information, resulting in more meaningful learning. Learners have been shown to be better able to engage in rational argumentation as a result of collaborative construction of a hypermedia knowledge base (Landow, 1989).

This report describes the results of a process for collaboratively annotating a book about hypertext design and the implications of that process for designing collaborative hypertext environments. The book was the product of a NATO-sponsored Advanced Research Workshop, "Designing Hypertext/Hypermedia for Learning" (Jonassen & Mandl, 1990), which was held in Rottenburg am Neckar, FRG, from July 3-8, 1989. This paper describes the process and results of a collaborative annotation process for inserting internal, conceptual linking in a book on hypermedia design. The results of that process, we believe, have implications for the design of collaborative hypermedia environments.

Context

The idea for the workshop resulted from the burgeoning interest in hypertext during the latter 1980s, combined with the frustrating lack of literature on learning applications for hypertext. There was little evidence in 1988 that hypertext could successfully support learning outcomes. A few projects were investigating hypertext for learning, but few conclusions were available and little if any advice on how to design hypertext for learning applications was available. Could hypertext support learning objectives? What mental processing requirements are unique to learning outcomes, and how do the processing requirements of learning outcomes interact with unique user processing requirements of browsing and constructing hypertext? Should hypertext information bases be restructured to accommodate learning outcomes? Should hypertext user interfaces be manipulated in order to support the task functionality of learning outcomes? Does the hypertext structure reflect the intellectual requirements of learning outcomes? What kinds of learning-oriented hypertext systems were being developed and what kinds of assumptions were these systems making? These and other questions demonstrated the need for this workshop.

The workshop took place over a five day period in a conference center in Rothenburg am Neckar in southwestern Germany. It was hosted by the Deutsches Institut für Fernstudien at the University of Tübingen. The workshop included a number of presentations by various researchers focusing on several themes, including:

Hypermedia and Learning

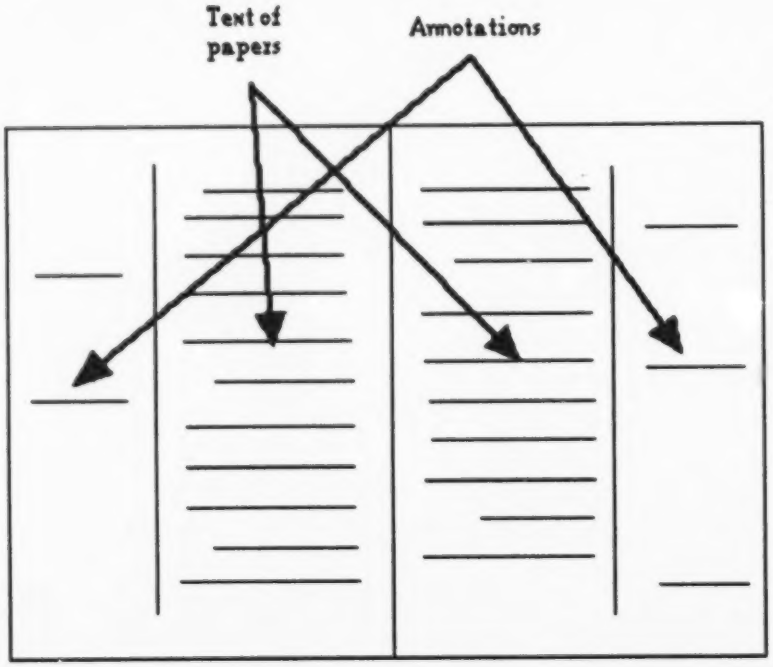
David Jonassen Scott Grabinger	Problems and Issues in Designing Hypertext/Hypermedia for Learning
John Leggett	Hypertext for Learning
George Landow	Popular Fallacies About Hypertext

Peter Whalley	Models of Hypertext Structure and Learning
	Designing the Information Model
Rainer Hammwohner	Macro-Operations for Hypertext Construction
Ray McAleese	Concepts as Hypertext Nodes: The Ability to Learn While Navigating Through Hypertext Nets
Piet Kommers	Graph Computation as an Orientation Device in Extended and Cyclic Hypertext Networks
	Designing the User Interface
Jakob Nielsen	Evaluating Hypertext Usability
Patricia Wright	Hypertexts as an Interface for Learners: Some Human Factors
Andrew Dillon	Dsigning the Human-Computer Interface to Hypermedia Applications
	Hypermedia and Instruction
Thomas Duffy	Hypermedia and Instruction: Where is the Match?
Terry Mayes	Learning About Learning from Hypertext
Armando Oliveira Duarte Costa Perreira	Psychopedagogic Aspects of Hypermedia Courseware
Wil Verrick, Anja Lkoundi	From Instructional Text to Instructional Hypertext: An Experiment
Cliff McKnight John Richardson Andrew Dillon	Journal Articles as Learning Resource: What Can Hypertext Offer?
Otmar Fölsche	Hypertext/Hypermedia-like Environments and Language Learning
Martin Richart Tom Rüdebusch	Collaboration in Hypermedia Environments
	Hypermedia Design Process
Alex Romiszowski	The Hypertext/Hypermedia Solution -- But What Exactly is the Problem?
Gary Marchionini	Evaluating Hypermedia-Based Learning
	Conceptual Foundations for Designing Hypermedia Systems for Learning
Eric Bruillard Gérard Weidenfeld	Some Examples of Hypertext's Applications

Max Mühlhäuser	Hyperinformation Requirements for an Integrated Authoring/Learning Environment
Norbert Streitz Jörg Hannemann	Elaborating Arguments: Writing, Learning, and in a Hypertext Based Environment for Authoring
Daniel Russell	Alexandria: A Learning Reseources Management Architecture

Problem

The conference consisted of the previous presentations, hardware demonstrations, sharing and browsing of hypertexts, and extensive discussions about all of the above. These latter experiences cannot be effectively shared with the reader of the proceedings. The topic of the conference, hypermedia, represents a dynamic knowledge representation form. It's most dynamic capacity, represented in the presentation by Richartz and Rüdebusch, is the collaborative contribution of different individuals to the knowledge base. In collaborative learning environments, the individuals involved are participants rather than mere respondents. Therefore, we attempted to share the experiences of the conference, especially the dialogue, with the readers of the book while representing the collaborative nature of the conference experience.



Page Layout of Book

Figure 1

Method

Procedure

Following the workshop, we asked each of the contributors to revise their papers to reflect the ideas and discussion shared at the workshop. Each paper needed to make heavier use of headings and to include a list of keywords. Each paper needed to state its assumptions about learning, characteristics of hypertext (one of the conclusions of the workshop was that we should use the more generic term, hypermedia, rather than hypertext), and provide some advice or guidelines for designing hypermedia for learning. These papers were collected and edited. They were re-organized into sections that reflected some of the themes of the workshop.

After receiving all of the edited contributions, the text was initially set using a desktop publishing system. The text of each paper was was set in the larger inside column of each page, leaving the outside column blank.

A copy of the entire book without any annotations was then sent to each participant in the workshop. Each participant was asked to read and annotate the other papers. Participants were given the option of using three types of annotations. The primary type was in the form of qualified annotations (McAleese, Anderson & Duncan, 1982; McAleese & Duncan, 1983). Qualified annotations consisted of predefined relations to be used to connect the text adjacent to the annotation with other text in the book. This type of annotation is similar to using a constrained set of asymmetric (two-way) referential links in hypertext. The qualified annotations used to link ideas in the book included:

example - specific instances of current topic
recommendation - principle for designing hypermedia
background - conceptual/theoretical foundations
explanation - expands or elaborates on current topic
corroboration - supports current topic
illustration - visual illustration of topic
contrast - contradictory interpretation or description
definition - definition of idea or topic
results - relevant research results
parallel - similar interpretation or description
implication - inferential conclusion
methodology - description of relevant research or design methodology

By following these annotated links, the reader may gain additional information (for example, explanation) about the topic that is defined by the link. So, an annotation such as "DJ explanation 4.13" means that DJ (a list of participants and their initials was provided in the introduction to the book) claims that there is an explanation of the idea(s) adjacent to the annotation that can be found on page 4.13. To support this process, it was necessary to provide two forms of pagination in the book, a running, sequential pagination and a chapter and page listing (eg. 4.13). The fomer was a required by the publisher, and the latter form was used to support the linking.

The second type of annotations were unqualified. Participants could provide short comments about the text adjacent to the comment. These were to be used when none of the qualified annotations applied or when there was no other text in the book to which to refer the reader.

The third type of annotation included references to external documents that the author of the text being annotated did not include in the paper. These document references were to be added when the external document has relevance to the discussion. These would enable the reader to follow up on particular discussions more readily. These are similar to symmetric (one way links) in hypertext.

These annotations were received by the primary editor via electronic mail. The electronic mail conference account automatically reflected each submission of annotations to all of the workshop participants via several electronic mail networks. This provided each author with the opportunity to read how other workshop participants reacted to his/her chapter. Each author then had the opportunity to amend their chapter in order to accommodate or react to the pertinent annotations and comments. Limited changes to the document were made to the text, so long as it

did not affect pagination. Finally, the annotations, comments, and references were added to the outside column of the book (see Figure 1), which was then printed out in its final form.

In addition to the annotations, other common hypermedia access tools, such as contents lists and keywords for each chapter, are provided.

Following the annotation process, a survey was sent to each of the participants to ascertain what the advantages and difficulties of the process were if they submitted annotations. We were also attempting to ascertain how the process could be facilitated and what benefits accrued.

Rationale

This elaborate and iterative process was undertaken for a number of reasons. First, we hoped that the quality of the ideas and writing would improve if subjected to the scrutiny of peers. Second, we wanted the book to exhibit some of the characteristics of hypermedia. The annotations represent internal links. The references represent external links to other documents. Were this a true hypermedium, the references would consist of links that transport the reader directly to the relevant portion of the referenced document. That is not possible in print without aggregating all of the relevant references in one book. Page and copyright restrictions preclude that. Third, we wanted the book to reflect some of the themes, issues, and opinions discussed but not resolved at the workshop — to engage the reader in some of the dialogues that engaged the participants during the workshop. Finally, we wanted to continue the dialogue begun at the workshop via an electronic mail conference. This represented an opportunity to apply an important technology to facilitating a collaborative process.

Results and Discussion

Over 300 annotations were entered on the network. These were received from only 65% of the workshop participants. The overwhelming majority of the annotations were qualified.

The two most common types of annotation were parallel and contrast, indicating that participants most often agreed and disagreed. Overall though, combining the parallel annotations with the three next most common annotations (corroboration, example, and explanation) yields more than two thirds of the annotations. All of these annotations are supportive of each other, either agreeing with the ideas being presented, helping to explain them, or providing additonal examples which is also explanatory. So rather than using annotation as an opportunity to contrast the diverse opinions presented at the workshop, participants chose to publicly agree with each other.

There was considerable unevenness in the number of annotations provided from various participants. A number of participants refused to participate in the process on principle. Their claim was that the book could not function as hypertext and that to force such a structure onto the book destroyed the continuity and coherence of the book. The most frequent comment receieved via the survey or from informal comments contributed over the e-mail network was that the process was considerably more difficult and time consuming than anticipated at the conference. The annotation process was perceived by those who did so as being much more arduous than they had anticipated. As one participant commented, "Linking is easier said than done." The primary difficulty was the memory load required to holding the contents and approximate location of the contents of a 300 page book in memory and relating it all to the rest of the content. Some participants evolved linking strategies for reducing memory load. They read the book mainly to place links from other articles to their own article and vice versa. The advantages of the linking process related to a focusing of the issues and concerns.

Annotation Type	#	Annotator	#	Date	#	Chapter	#
background	14	Duchastel	5	1/10/90	14	1	36
comment	39	Hammwöhner	7	1/11/90	7	2	6
contrast	72	Jonassen	128	1/12/90	9	3	32
corroboration	45	Duffy/Knuth	20	1/22/90	20	4	26
definition	19	Kommers	14	1/29/90	7	5	12
description	1	Landow	21	2/5/90	15	6	31
example	47	Leggett	59	2/6/90	7	7	24
explanation	54	Marchionini	7	2/7/90	6	8	23
illustration	2	Romiszowski	67	2/9/90	15	9	6
implication	9	Russell	13	2/12/90	59	10	16
methodology	8	Streitz	40	2/14/90	14	11	3
parallel	95	Verrick	16	2/16/90	12	12	27
recommendation	12	Whalley	9	2/19/90	12	13	24
reference	5	Wright	21	2/20/90	129	14	1
results	10			2/23/90	15	15	16
				3/13/90	66	16	8
					17	3	
					18	9	
					19	21	
					20	9	
					21	5	
					22	3	
					24	8	

Table 1
Summary of Annotations

Most of the annotations were submitted in blocks, as authors saved their annotations until they could send them altogether. With only two exceptions, participants sent only one block of annotations.

There was also unevenness in the number of annotations per chapter. The early chapters tended to be annotated more heavily.

Different participants used the linking process to support different types of arguments. That is, there were significant differences in the types of links generated by the different participants. Some generated primarily "contrast" links while others generated "example" and explanation" links. While we had anticipated that the process would provide more of a venue for argumentation, it actually became a medium for mutual support.

Another expressed concern was over the symmetry of the links. The process provided only for one-way links with no return provided. Some particpants expressed concern that such links were not as meanigful as assymmatric links that go both ways.

A number of participants commented on the static nature of the knowledge base. Concern was expressed about the difficulties of annotating a static knowledge base (a print book) and how much more difficult that might become in a dynamic, collaboratively constructed hypermedia knowledge base.

Finally, the syntactic requirements of sharing annotations in an electronic mail environment constrained the sharing process.

Implications for Hypertext

From the annotations and comments that accompanied them, the following recommendations can b made.

- Since each author is most familiar with his/her own chapter, then annotate the other chapters in the book by providing annotations back to your own chapter or read the text with the thought of annotating your own contribution by relating it to the others.
- Depending upon the purpose of the collaborative hypertext, develop a tighter argument structure using fewer annotation types. Collaborative hypertext systems, such as IBIS (Conklin & Begemen, 1987), provide a limited set of options. Users can identifiy issues, add positions to those issues, and then add arguments to the positions. We use such a structure to organize discussion in a doctoral seminar. When individual wnat to add an issue, they are given the choice of declaring advantage, disadvantage, application, problem or limitation nodes when comparing models of instruction.
- Provide multiple access points to the hypertext being annotated. Linear documents are more closely scrutnized in the beginning with interest and commitment waning toward the end of the document. Help users to access the document, that is begin processing the document, in different places to ensure even annotations.
- Develop some form of cueing help to asist the annotation process. A bookmarking type of cues that can be placed in the hypertext at different locations would reduce the memory load.
- Provide the option of creating symmetric or assymmetric links. If two way links are used, ten require that participants define the nature of the link in both directions, since it is bound to differ.

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